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NPIC/D-50-65
07 APR 1965

MEMORANDUM FOR: Assistant Deputy Director (Intelligence)

SUBJECT : Research and Development Project Approval Request for the Development of an Improved Rear Projection Screen

REFERENCE : DDCI Memorandum ER 63-88121, dated 23 December 1963, Approval of Research and Development Activities

In compliance with paragraph 5.b. of the reference, it is requested that the development of an improved rear projection screen in the amount of [redacted] as outlined in attachment "A" be approved. 25X1

[redacted] 25X1

ARTHUR C. LUNDAHL
Director
National Photographic Interpretation Center

APPROVED: [redacted] 25X1

9 APR 1965
Date

Assistant Deputy Director
(Intelligence)

Attachment: "A"

Distribution
Orig & 1 - LB/SS/NPIC
1 - A/DDI
1 - O/Dir
1 - P&DS

LB/SS/NPIC [redacted] April 1965) 25X1

Excluded from automatic downgrading and declassification

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(When Filled In)

R & D CATALOG FORM

DATE 15 March 1965

1. PROJECT TITLE/CODE NAME
Improved Rear-Projection Screen

2. SHORT PROJECT DESCRIPTION This project is to study, develop, and evaluate unique materials; the best of which will be utilized in the development of a rear-projection screen having improved performance (Contd

3. CONTRACTOR NAME
Corning Glass Works

4. LOCATION OF CONTRACTOR
3900 Electronics Drive
Raleigh, North Carolina 27604

5. CLASS OF CONTRACTOR
Manufacturer

6. TYPE OF CONTRACT
CPFF

7. FUNDS
FY 19 $

8. REQUISITION NO.
NA

9. BUDGET PROJECT NO.
NP-V-14

FY 1965

FY 19 $

10. EFFECTIVE CONTRACT DATE (Begin - end)
June 1965 - September 1966

11. SECURITY CLASS.
A.A. - Confidential
T. - Unclassified
W. - Unclassified

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12. RESPONSIBLE DIRECTORATE/OFFICE/PROJECT OFFICER TELEPHONE EXTENSION
DDI/NPIC/P&DS/

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13. REQUIREMENT/AUTHORITY This development will achieve a higher screen efficiency than current rear-projection screens. An improved screen will not restrict the photo-interpreter by the information transfer limitations of the screen. A development of this type is needed by NPIC/PAG and NPIC/PID.

14. TYPE OF WORK TO BE DONE
Applied Research

15. CATEGORIES OF EFFORT

MAJOR CATEGORY	SUB-CATEGORIES
Viewers and Other Interpretation Equipment	Interpretation/Analysis
	Photo Reconnaissance
	Visual

16. END ITEM OR SERVICES FROM THIS CONTRACT/IMPROVEMENT OVER CURRENT SYSTEM, EQUIPMENT, ETC.
Final Report and breadboard samples. The improved screen would minimize the degrading effects of dispersion, diffraction, back-scattering and reflection.

17. SUPPORTING OR RELATED CONTRACTS (Agency & Other)/COORDINATION
Due to contacts throughout industry and the Intelligence Community, it has been determined that no equivalent screen material is under development.

18. DESCRIPTION OF INTELLIGENCE REQUIREMENT AND DETAILED TECHNICAL DESCRIPTION OF PROJECT (Continue on additional page if required) Most of the photography received at NPIC must first be scanned to select areas for detailed analysis. A large percentage of the scanning operation is accomplished utilizing rear-projection viewers. Of all the components within the viewer, the screen has the lowest efficiency and consequently needs the most improvement.

Because a rear-projection screen has a very low efficiency, much of the projected illumination is lost and this loss requires higher intensity (Contd)

19. APPROVED BY AND DATE

OFFICE	DEPUTY DIRECTOR	DDCI

FORM

SECRET

R & D CATALOG FORM (Continued)

2. in reflectance, uniform dispersion and back-scattering.

18. illumination to be projected through the film thereby causing overheating of the film. If the screen could be improved, less illumination would be required. The present screens have several objectionable characteristics:

1. Cause dispersion and diffraction, thereby introducing color and graininess.

2. Back-scatter as much as 50% of the incident illumination, thereby reducing efficiency.

3. Reflect a high percentage of ambient light and internally reflect a considerable portion of the dispersed projection light -- both effects significantly diminish contrast.

A rear-projection screen will be developed which will significantly minimize these degrading effects.

This development will consider the limitations described above; at the same time, attention will be given to the following:

a. Resolution must be comparable to that of existing screens.
b. Size as large as 30" x 30" must be feasible.
c. Economy must be consistent with that of typical rear-projection viewers.

The screen should have the following desirable characteristics:

1. The screen should reproduce or transmit an image with minimum color dispersion and graininess. Appearance approaching that of the virtual image in a direct-viewing optical system is the goal.

2. Conventional light-scattering screens exhibit mutually exclusive properties of axial gain and angular gain. To increase angular gain (luminance), more scattering is required; and this, in turn, decreases axial gain. More important, this also increases back-scattering and reduces efficiency. Consequently, it is required that the improved screen display relatively uniform luminance ($\pm$ 15%) over a solid angle of 90° centered on the axial ray with less than 15% back-scattering.

3. The primary property which degrades contrast in conventional screens is internal and external reflectance. The improved screen should minimize this property. A reflectance characteristic approaching that of black velvet is ideal.

R & D CATALOG FORM (Continued)

18. In an ambient light level of 5 foot-lamberts and an incident signal intensity range of 2000 to 1, the improved screen should display a brightness range of 1000 to 1.

4. The improved screen should exhibit a resolution of 10 lines per mm at 90% modulation transfer function: The desired goal is 20 lines per millimeter at 90% MTF.

This development consists of a study of the various glass and glass ceramic materials which may prove valuable as basic materials for constructing an improved rear-projection screen. The work will include only available materials and processes; although excursions into variations of existing materials will be made, as necessary, to point the direction for further work. Thus, whatever success is achieved will be transferable with little delay to practical screens.

Although Corning's demonstrated abilities in optical technology are important to the success of this project, the greatest contribution the Company can make is in the field of materials technology. Much of the work will involve the evaluation of unique materials which are created by selective molecular changes in the materials themselves. Many available materials which have never been examined for their optical and diffusive properties will be evaluated; such as conventional and exotic optical glasses and other Corning materials for which optical properties can be altered by molecular manipulation. Among the most promising materials are photosensitive glass, porous silica glass and sintered glass.

The project will be divided into three sections, (1) a short study of all available literature, (2) a theoretical investigation in which the many theories of light scattering are reviewed for their applicability and relationship to the properties of available materials, (3) experimentation into the most feasible approaches. It is expected to be possible to combine the desirable properties of different materials to optimize the performance against the objectives for appearance, efficiency, contrast and resolution. In the course of the experimentation, samples will be built for evaluation which later will be delivered to the sponsor. Where exceptionally good results are realized, every effort will be made to provide the sponsor with a practical sample for evaluation.

Proposals were solicitated from seven companies with only three, [redacted] Corning responding. Of these three, the Corning proposal is by far the most significant, being the only one which proposes new approaches and materials. 25X1

Because NPIC has not had contractual actions with this Company, the required security measures are not in effect at the contractors plant; however, [redacted] (Corning's representative to the Government) holds an Agency secret clearance. 25X1